STUDY ON
N-COMBUSTIBLE
SLOPING ROOF ASSEMBLIES
O.H.C. JOB NUMBER R&D - 14

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Project Number: 86+165C

Date: November 3rd, 1986

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ROBERT HALSALL AND ASSOCIATES LTD., CONSULTING ENGINEERS
[illegible]

36x165C/A1
November 3, 1986

Ministry of Municipal Affairs and Housing
Ontario Housing Corporation
Technical Support Department
777 Bay Street, 2nd Floor
Toronto, Ontario
M5G 2E5

Attention: Mr. M. Abichandani
Codes and Standards Officer

Re: Non-Combustible Sloping Roof Assemblies
O.H.C. Job Number R & D - 14

Dear Sirs:

We are pleased to submit this report on our work, completed in accordance with your letter of authorization dated September 2nd, 1986.

Yours very truly
ROBERT HALSALL AND ASSOCIATES LIMITED

Robert Halsall, P.Eng.
RH/kep

Enclosure

NON-COMBUSTIBLE SLOPING ROOFS

Estimated Comparative Costs

• BASE ASSEMBLY	Reference Drawing	Cost/m^2 of Roof
Precast prestressed concrete flat-roof deck with light-weight fill, 100 mm polystyrene insulation 108 kg/m^2 ballast. Masonry insulated cavity wall parapet.	S1	$162.00/$m^2$

• PROPOSED ASSEMBLIES

1. Fire-retardant, pressure treated wood trusses and plywood deck, 2 layers 15.9 mm drywall ceiling, Type X, 305 mm glass fibre batt insulation, eaves and ridge ventilation, asphalt shingle roof finish.	S2	$157.00/$m^2$
2. Precast concrete ceiling with built-up open metal stud walls and steel rafters. 2 layers 15.9 mm drywall ceiling, 305 mm glass fibre batt insulation, eaves and ridge ventilation. Prefinished metal roof deck.	S3	$223.00/$m^2$
3. As in Scheme No. 1, but with prefinished metal roof finish.	S2	$225.00/$m^2$
4. Metal ceiling joists and roof rafters, on open metal stud walls over corridor walls, 2 layers 15.9 mm drywall ceiling, 305 mm glass fibre batt insulation, eaves and ridge ventilation. Prefinished metal roof deck.	S4	$252.00/$m^2$
5. Metal prefabricated trusses. 2 layers 15.9 mm drywall ceiling, 305 mm glass fibre insulation, eaves and ridge ventilation. Prefinished metal roof deck.	S5	$258.00/$m^2$

NON-COMBUSTIBLE SLOPING ROOFS

Extra Cost Over Base Construction For A Typical 20 Unit - 2 Storey Building

- Unit Average gross Floor Area = $64 m^2$
- Building Area 20 unit building = 10 x 64 = $640 m^2$

• BASE ASSEMBLY	Cost/Unit	Reference Drawing
Precast Concrete Flat Roof Building roof Assembly Cost = $162.00 x 640 Roof Assembly Cost/Unit	= $103,680 = $\frac{\$103,680}{20}$ = $5184/unit	S1

- PROPOSED ASSEMBLIES

1. Fire-retardant pressure treated wood truss with Asphalt shingles Building Roof Assembly Cost - $157.00 x 640 Roof Assembly Cost/unit	= $100,480 = $\frac{\$100,480}{20}$ = $5024/-	S2
Saving over base construction - $5184 - 5024	= $160/unit	
2. Precast Concrete Ceiling Deck with built-up open Metal Stud wall with Metal framing and metal roofing Building roof assembly Cost - $223 x 640 Roof Assembly Cost/unit	= $142,720 = $\frac{\$142,720}{20}$ = $7136	S3
Extra cost over base construction = $7136 - $5184	= $1952/unit	
3. Fire-retardant Pressure Treated Wood Truss with prefinished metal roofing Building roof Assembly Cost = $225.00 x 640 Roof Assembly Cost/unit	= $144,000 = $\frac{\$144,000}{20}$ = $7200	S2
Extra Cost over Base Construction = $7200 - $5184	= $2016/unit	

	Cost/Unit	Reference Drawing
4. Metal rafter ceiling, metal roof rafters and metal roofing		
Building roof Assembly Cost = $252 x 640	= $161,280	
Roof Assembly Cost/unit	= $161,280 / 20	
	= $8064	S4
Extra Cost over Base Construction = $8064 - $5184	= $2880/unit	
5. Coldformed metal prefabricated trusses		
Building roof Assembly Cost = $258 x 640	= $165,120	
Roof Assembly Cost/unit	= $165,120 / 20	S5
	= $8256	
Extra cost over base construction = $8256 - $5184	= $3072/unit	

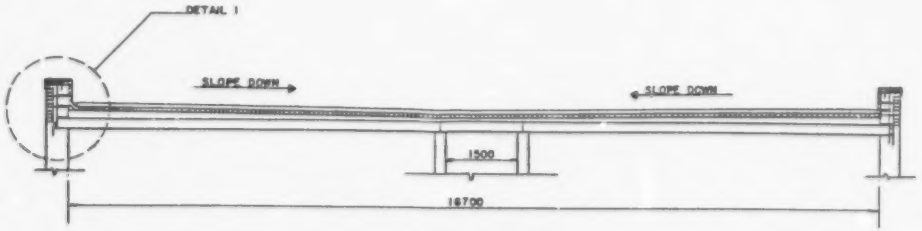
STUDY ON NON-COMBUSTIBLE
SLOPING ROOF ASSEMBLIES
O.H.C. JOB NUMBER R&D- 14

DRAWINGS S1, S2, S3, S4, AND S5

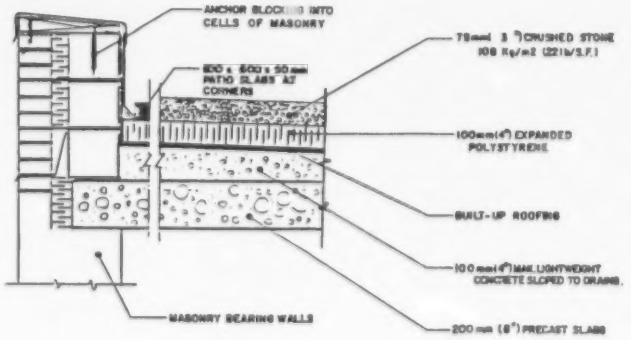
GENERAL NOTES

1. THESE TYPICAL ROOF ASSEMBLY DRAWINGS S1 TO S5 ILLUSTRATE A CONVENTIONAL FLAT ROOF SYSTEM, AND ALTERNATIVE PITCHED ROOF SYSTEMS WITH VENTILATED CEILINGS.
2. DESIGNS ARE REPRESENTATIVE ONLY, AND FOR EACH INDIVIDUAL PROJECT STRUCTURAL DESIGN AND DETAILS SHALL BE THE RESPONSIBILITY OF THE PROJECT DESIGN ARCHITECT AND ENGINEER.
3. COMPLY WITH ALL REQUIREMENTS OF THE ONTARIO BUILDING CODE AND THE ONTARIO HOUSING CORPORATION TECHNICAL GUIDE FOR SENIOR CITIZENS HOUSING, REV 6R.
4. SUBMIT FULLY DETAILED SHOP DRAWINGS BEARING THE SEAL OF THE PROFESSIONAL ENGINEER RESPONSIBLE FOR THE DETAILED DESIGN, AND FABRICATION PROCEDURES.
5. THESE REPRESENTATIVE DESIGNS ARE BASED ON AREAS WITH GROUND SNOW LOAD OF 3 kPa, AND ROOF SNOW LOAD OF 2.4 kPa, AND OVER 5000 DEGREE DAYS BELOW +18°C.
6. INCREASE SNOW LOADING AS REQUIRED FOR PILING AT ANY VALLEYS, OR PROJECTIONS ABOVE ROOF.

Sheet S-1



CROSS SECTION


ANCHOR BLOCKING INTO CELLS OF MASONRY
75mm 3 "CRUSHED STONE 108 Kg/m2 (22lb/S.F.)
100mm(4") EXPANDED POLYSTYRENE
BUILT-UP ROOFING
100 mm(4") MAK LIGHTWEIGHT CONCRETE SLOPED TO DRAINS.
MASONRY BEARING WALLS
200 mm (8") PRECAST SLABS

DETAIL 1

FLAT ROOF - BASE SYSTEM FOR COMPARISON

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Ministry of Housing
Architectural Services
Technical Support Branch
777 Bay Street
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Date OCT 28/81

Sheet S-1

FLAT ROOF SYSTEM, AS BASIS FOR COMPARISON

1. This system is illustrated on Drawing S1.

2. Conventional prestressed precast concrete slabs are installed on load bearing masonry walls.

3. Slopes to roof drains, at least 1:50, are provided by means of a lightweight concrete fill.

4. A protected membrane roofing system with a Class 'A' membrane conforming to C.R.C.A. Roofing Specification 60-11, and 100 mm of expanded polystyrene, has 75 mm of crushed stone ballast, with 600 x 600 x 50 mm paving slabs at corners.

5. Parapets approximately 600 high are included.

6. The system illustrated conforms generally to the detail C7/13 in O.H.C. Technical Guide for Senior Citizens' Housing, with an increase in ballast weight, and the introduction of insulation within the parapet, as requested by O.H.C. during the course of this study.

ALTERNATIVE NO. 1 - WOOD FRAMING WITH ASPHALT SHINGLES

1. This system is illustrated on Drawing S2.

2. Fire-retardant treated wood trusses are installed at 600 centres, on load bearing metal stud or masonry walls.

3. A 1-hour rating to the roof assembly is provided by a ceiling of 2 layers of 15.9 mm, Type 'X' gypsum wallboard.

4. This would ensure that the roof assembly complied with the requirements of the Ontario Building Code for Seniors' Residences of 2 or 3 stories.

5. O.H.C. Technical Guide for 2 and 3-storey Senior Citizens' Housing demands standards higher than required by O.B.C., and stipulates that such buildings meet the non-combustible standards equivalent to those for 4-storey Group 'C' Residential Occupancy Buildings.

6. The schemes shown as Alternative No. 1 and No. 2, do not totally comply with the letter of the Technical Guide for Senior Citizens' Housing Standards, but are included by agreement with the O.H.C., as somewhat of a compromise. Fire-retardant treated wood material is used throughout, for framing and deck.

7. Insulation and ventilation follow standards illustrated on C7/12 of the Technical Guide for Senior Citizens' Housing Standards.

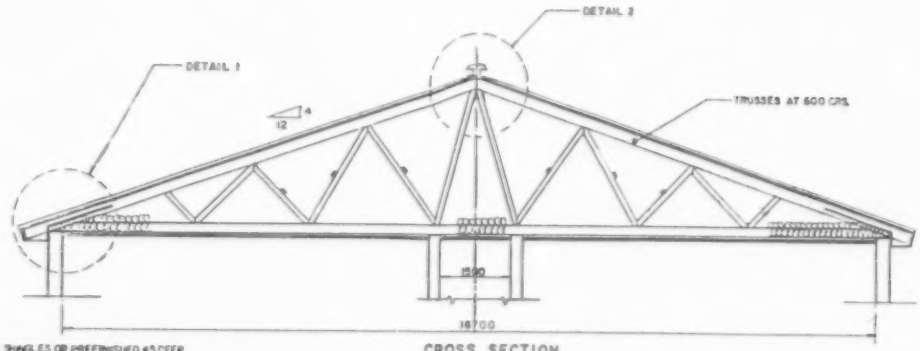
8. The wood truss member sizes and connector plates are to be finally designed by the supplier, but the sizes and configurations shown on Drawing S2 comply with the products of one representative manufacturer.

NOTES

1. SEE ALSO GENERAL NOTES ON S1.
2. ALL SAWN TIMBER AND PLYWOOD SHALL HAVE PRESSURE-IMPREGNATED FIRE-RETARDANT TREATMENT IN ACCORDANCE WITH THE REQUIREMENTS OF CAN4-S102, EXTENDED FOR 30 MINUTES, WITH FLAME-SPREAD NOT OVER EQUIVALENT 25, AND SHALL CARRY ULC LABEL OR LISTED MARKINGS.
3. EAVES GUTTERS ARE NOT RECOMMENDED FOR NORTHERN REGIONS, BUT, IF THEY ARE INSTALLED, SPECIFIC PROVISIONS SHALL BE TAKEN TO PROTECT BOTTOM OF ROOF SLOPE FROM PENETRATION BY WATER, SNOW, AND ICE.
4. METAL DECK TO BE PREFINISHED, GALVANIZED STEEL SHEET, 0.68 MINIMUM THICKNESS, WITH 45 HIGH UPSTANDING SEAMED JOINTS AT 500 MAXIMUM CENTRES. JOINTS TO BE CAULKED OR GASKETTED AND ROLLED TIGHT AFTER INSTALLATION. ALL FASTENERS ARE TO BE CONCEALED.
5. GUTTERS ARE NOT RECOMMENDED FOR NORTHERN REGIONS, BUT IF THEY ARE INSTALLED, SINGLE-PLY MEMBRANE IS RECOMMENDED ON TOP OF PLYWOOD FOR AT LEAST 2.6 M FROM GUTTER.

   SIMILAR PRECAUTIONS ARE NEEDED AT ANY VALLEYS OR PROJECTIONS THROUGH ROOF.

Sheet S-2



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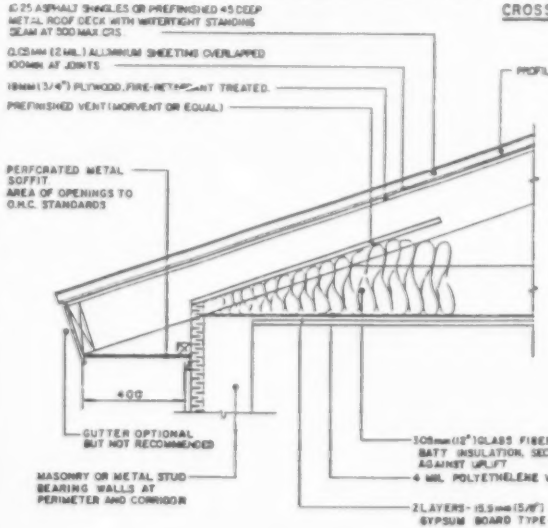
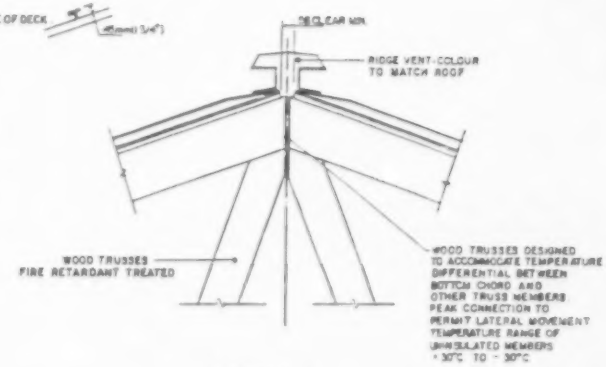

12.25 ASPHALT SHINGLES OR PREFINISHED 45 DEEP METAL ROOF DECK with WATERTIGHT STANDING SEAM AT 500 MAX CRS.
0.125mm (2 MIL.) ALUMINUM SHEETING OVERLAPPED 100mm AT JOINTS
19mm (3/4") PLYWOOD, FIRE-RETARDANT TREATED.
PREFINISHED VENT (MORVENT OR EQUAL)
PERFORATED METAL SOFFIT
AREA OF OPENINGS TO O.N.C. STANDARDS
PROFILE OF DECK
400
GUTTER OPTIONAL BUT NOT RECOMMENDED
MASONRY OR METAL STUD BEARING WALLS AT PERIMETER AND CORRIDOR
305mm (12") GLASS FIBER BATT INSULATION, SECURED AGAINST UPLIFT
4 MIL. POLYETHELENE V.B.
2 LAYERS - 15.9mm (5/8") GYPSUM BOARD TYPE - X

DETAIL 1


RIDGE VENT - COLOUR TO MATCH ROOF
WOOD TRUSSES FIRE RETARDANT TREATED
WOOD TRUSSES DESIGNED TO ACCOMMODATE TEMPERATURE DIFFERENTIAL BETWEEN BOTTOM CHORD AND OTHER TRUSS MEMBERS PEAK CONNECTION TO PERMIT LATERAL MOVEMENT TEMPERATURE RANGE OF UNINSULATED MEMBERS + 30°C TO - 30°C

DETAIL 2

ALTERNATIVE 1 — FIRE-RETARDANT TREATED WOOD CONSTRUCTION.
TRUSSES AT 600 CRS WITH ASPHALT SHINGLES

ALTERNATIVE 2— FIRE-RETARDANT TREATED WOOD CONSTRUCTION.
TRUSSES AT 600 CRS WITH METAL ROOFING

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777 Bay Street
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ALTERNATIVE NO. 2 - WOOD FRAMING WITH METAL DECK

1. This system is illustrated on Drawing S2.

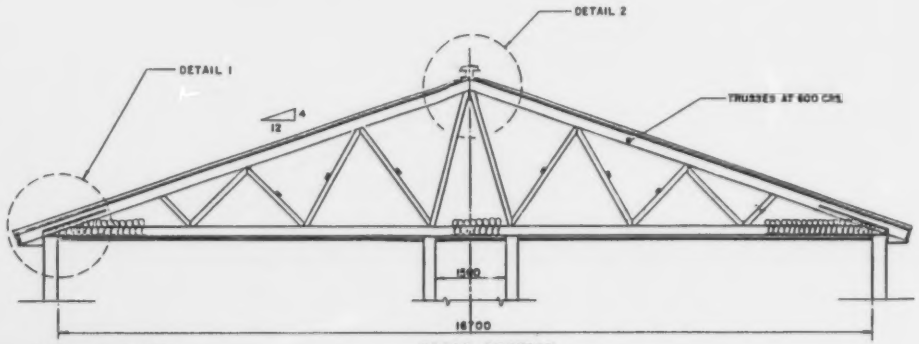
2. The only difference is the substitution of non-combustible metal deck for the asphalt shingles included in Alternative No. 1.

NOTES

1. SEE ALSO GENERAL NOTES ON S1.
2. ALL SAWN TIMBER AND PLYWOOD SHALL HAVE PRESSURE-IMPREGNATED FIRE-RETARDANT TREATMENT IN ACCORDANCE WITH THE REQUIREMENTS OF CAN4-S102, EXTENDED FOR 30 MINUTES, WITH FLAME-SPREAD NOT OVER EQUIVALENT 25, AND SHALL CARRY ULC LABEL OR LISTED MARKINGS.
3. EAVES GUTTERS ARE NOT RECOMMENDED FOR NORTHERN REGIONS, BUT, IF THEY ARE INSTALLED, SPECIFIC PROVISIONS SHALL BE TAKEN TO PROTECT BOTTOM OF ROOF SLOPE FROM PENETRATION BY WATER, SNOW, AND ICE.
4. METAL DECK TO BE PREFINISHED, GALVANIZED STEEL SHEET, 0.69 MINIMUM THICKNESS, WITH 45 HIGH UPSTANDING SEAMED JOINTS AT 500 MAXIMUM CENTRES. JOINTS TO BE CAULKED OR GASKETTED AND ROLLED TIGHT AFTER INSTALLATION. ALL FASTENERS ARE TO BE CONCEALED.
5. GUTTERS ARE NOT RECOMMENDED FOR NORTHERN REGIONS, BUT IF THEY ARE INSTALLED, SINGLE-PLY MEMBRANE IS RECOMMENDED ON TOP OF PLYWOOD FOR AT LEAST 2.5 M FROM GUTTER.

   SIMILAR PRECAUTIONS ARE NEEDED AT ANY VALLEYS OR PROJECTIONS THROUGH ROOF.

Sheet S-2



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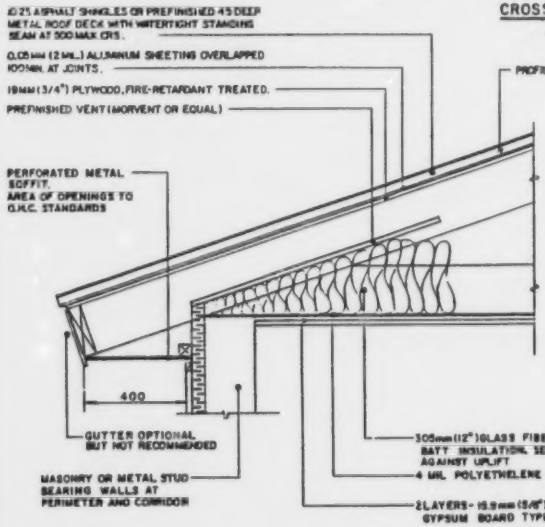
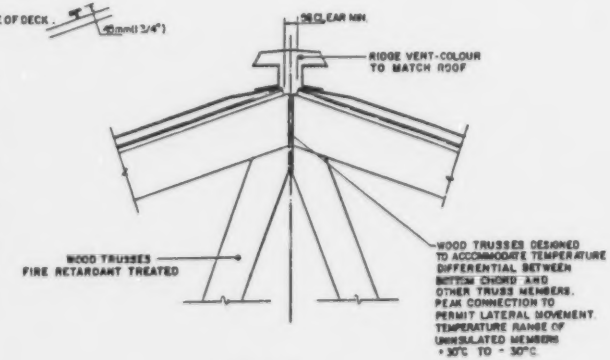

.025 ASPHALT SHINGLES OR PREFINISHED 45 DEEP METAL ROOF DECK WITH WATERTIGHT STANDING SEAM AT 500 MAX CRS.
0.05 mm (2 MIL.) ALUMINUM SHEETING OVERLAPPED 100 MIN. AT JOINTS.
19MM (3/4") PLYWOOD, FIRE-RETARDANT TREATED.
PREFINISHED VENT (MORVENT OR EQUAL)
PROFILE OF DECK
PERFORATED METAL SOFFIT. AREA OF OPENINGS TO O.N.C. STANDARDS
400
GUTTER OPTIONAL BUT NOT RECOMMENDED
MASONRY OR METAL STUD BEARING WALLS AT PERIMETER AND CORRIDOR
305mm (12") GLASS FIBER BATT INSULATION, SECURED AGAINST UPLIFT
4 MIL POLYETHELENE V.B.
2 LAYERS - 15.9 mm (5/8") GYPSUM BOARD TYPE - X

DETAIL 1


50 CLEAR MIN.
RIDGE VENT - COLOUR TO MATCH ROOF
WOOD TRUSSES FIRE RETARDANT TREATED
WOOD TRUSSES DESIGNED TO ACCOMMODATE TEMPERATURE DIFFERENTIAL BETWEEN BOTTOM CHORD AND OTHER TRUSS MEMBERS. PEAK CONNECTION TO PERMIT LATERAL MOVEMENT. TEMPERATURE RANGE OF UNINSULATED MEMBERS +30°C TO - 30°C.

DETAIL 2

ALTERNATIVE 1 — FIRE-RETARDANT TREATED WOOD CONSTRUCTION. TRUSSES AT 600 CRS. WITH ASPHALT SHINGLES

ALTERNATIVE 2— FIRE-RETARDANT TREATED WOOD CONSTRUCTION.

NOTES

1. SEE ALSO GENERAL NOTES ON S1.
2. ALL SAWN TIMBER AND PLYWOOD SHALL HAVE PRESSURE-IMPREGNATED FIRE-RETARDANT TREATMENT IN ACCORDANCE WITH THE REQUIREMENTS OF CAN4-S102, EXTENDED FOR 30 MINUTES, WITH FLAME-SPREAD NOT OVER EQUIVALENT 25, AND SHALL CARRY ULC LABEL OR LISTED MARKINGS.
3. METAL DECK TO BE PREFINISHED, GALVANIZED STEEL SHEET, 0.69 MINIMUM THICKNESS, WITH 45 HIGH UPSTANDING SEAMED JOINTS AT 500 MAXIMUM CENTRES. JOINTS TO BE CAULKED OR GASKETTED AND ROLLED TIGHT AFTER INSTALLATION. ALL FASTENERS ARE TO BE CONCEALED.
4. GUTTERS ARE NOT RECOMMENDED FOR NORTHERN REGIONS, BUT IF THEY ARE INSTALLED, SINGLE-PLY MEMBRANE IS RECOMMENDED ON TOP OF PLYWOOD FOR AT LEAST 2.5 M FROM GUTTER.

   SIMILAR PRECAUTIONS ARE NEEDED AT ANY VALLEYS OR PROJECTIONS THROUGH ROOF.
5. FIXINGS FOR ALUMINUM SHEETING AND METAL DECK ARE TO BE SELECTED AND DETAILED TO SUIT THE PANEL CHOSEN.

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Sheet S-2

ALTERNATIVE NO. 3 - PRECAST CONCRETE STRUCTURE AT CEILING LEVEL, WITH BUILT-UP METAL STUD FRAMING AND METAL ROOF DECK

1. This system is illustrated on Drawing S3.

2. The structural roof is at ceiling level and consists of precast prestressed concrete slabs, as the basic flat roof scheme.

3. A "cold roof" is built upon this precast structure consisting of metal stud walls and metal roof deck carried by cold-formed rafters and purlins.

4. Insulation is applied on top of the precast slabs.

5. Different profiles and thicknesses of cold-formed sections are produced by different manufacturers. Final design will depend on the properties of the sections being offered by bidders. We have stipulated that design shall be in accordance with the relevant specifications, and detailed shop drawings are to bear the seal of the engineer responsible for design, fabrication, and erection procedures, who shall be experienced in the design of light-gauge steel members.

NOTES

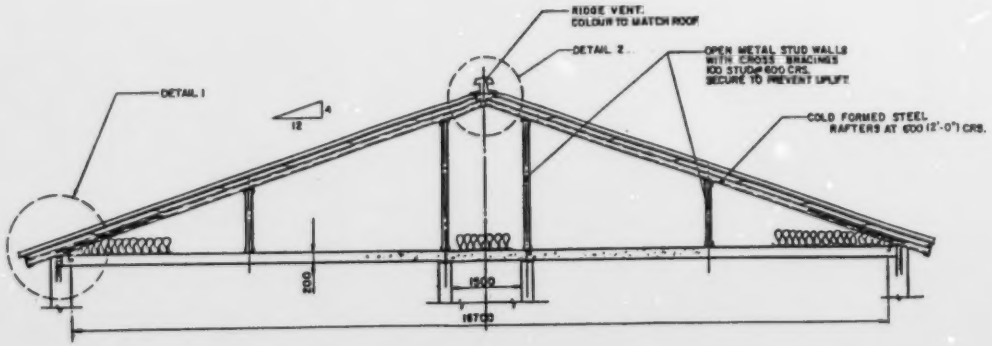
1. SEE ALSO GENERAL NOTES ON S1.
2. METAL DECK TO BE PREFINISHED, GALVANIZED STEEL SHEET, 0.68 MINIMUM THICKNESS, WITH 45 HIGH UPSTANDING SEAMED JOINTS AT 500 MAXIMUM CENTRES, AND DESIGNED TO SUPPORT INDICATED SNOW LOADINGS AT PURLIN SPACING INDICATED.

   JOINTS TO BE CAULKED OR GASKETTED AND ROLLED TIGHT AFTER INSTALLATION. ALL FASTENERS ARE TO BE CONCEALED. PROVIDE WEATHERTIGHT FILLER AT TOP AND BOTTOM OF ROOF SLOPE.
3. PURLINS, RAFTERS, CEILING JOISTS, AND STUD FRAMING TO BE COLD-FORMED GALVANIZED STEEL SECTIONS DESIGNED, FABRICATED AND INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF ONTARIO BUILDING CODE, CSA CAN3-S136, AND THE LATEST RECOMMENDATIONS OF THE CANADIAN SHEET STEEL BUILDING INSTITUTE.
4. DETAILED DESIGN SHALL TAKE INTO ACCOUNT DOWN-SLOPE COMPONENT OF GRAVITY LOADS AND LACK OF RESTRAINT OR DIAPHRAGM ACTION PROVIDED BY ROOFING.
5. DESIGN FOR TEMPERATURE RANGE +10°C to -30°C.
6. DETAILED SHOP DRAWINGS TO BEAR SEAL OF ENGINEER RESPONSIBLE FOR DESIGN, FABRICATION, AND ERECTION PROCEDURES, AND SHALL BE EXPERIENCED IN THE DESIGN OF LIGHT-GAUGE STEEL MEMBERS.
7. GUTTERS ARE NOT RECOMMENDED FOR NORTHERN REGIONS, BUT IF THEY ARE INSTALLED, SPECIAL PROVISIONS SHALL BE TAKEN TO PROTECT BOTTOM OF ROOF SLOPE FROM PENETRATION BY WATER, SNOW, AND ICE.

   GALVANIZED METAL SHEET, OR FIRE-RETARDANT TREATED PLYWOOD SHEATHING WITH SINGLE-PLY MEMBRANE IS RECOMMENDED BETWEEN PURLINS AND METAL DECK, FOR AT LEAST 2.5 M FROM GUTTER. ADJUST "Z" PURLIN DEPTH ACCORDINGLY.

   SIMILAR PRECAUTIONS ARE NEEDED AT ANY VALLEYS OR PROJECTIONS THROUGH ROOF.

Sheet S-3



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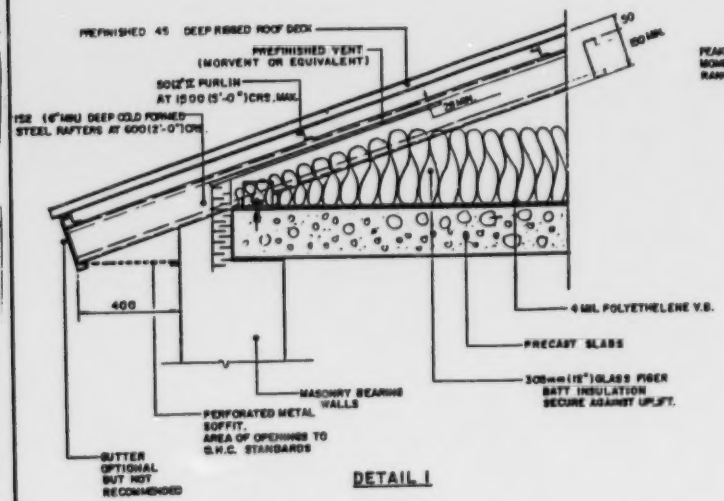
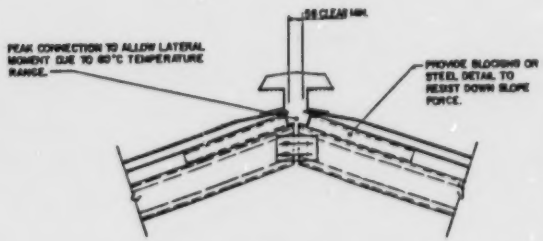

PREFINISHED 45 DEEP RIBBED ROOF DECK
PREFINISHED VENT (NORVENT OR EQUIVALENT)
50
150 MIN.
50x12" PURLIN AT 1500 (5'-0") CRS. MAX.
38 MIN.
152 (6"MIN) DEEP COLD FORMED STEEL RAFTERS AT 600 (2'-0") CRS.
400
4 MIL POLYETHELENE V.B.
PRECAST SLABS
308mm (12") GLASS FIBER BATT INSULATION SECURE AGAINST UPLIFT.
MASONRY BEARING WALLS
PERFORATED METAL SOFFIT. AREA OF OPENINGS TO O.W.C. STANDARDS
GUTTER OPTIONAL BUT NOT RECOMMENDED

DETAIL 1


PEAK CONNECTION TO ALLOW LATERAL MOVEMENT DUE TO 60°C TEMPERATURE RANGE.
50 CLEAR MIN.
PROVIDE BLOCKING OR STEEL DETAIL TO RESIST DOWN SLOPE FORCE.

DETAIL-2

ALTERNATIVE 3 - METAL FRAMING OVER PRECAST CONCRETE DECK.

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Sheet S-3

ALTERNATIVE NO. 4 - COLD-FORMED CEILING JOISTS AND ROOF RAFTERS, WITH METAL ROOF DECK

1. This system is illustrated on Drawing S4.

2. Roof loading is carried by cold-formed steel rafters supported by the exterior walls of the building and stud walls above the corridor walls.

3. Cold-formed ceiling joists carry the ceiling and insulation.

4. The same comments regarding the supply and design of cold-formed framing, as given for the previous system, apply to this system.

NOTES

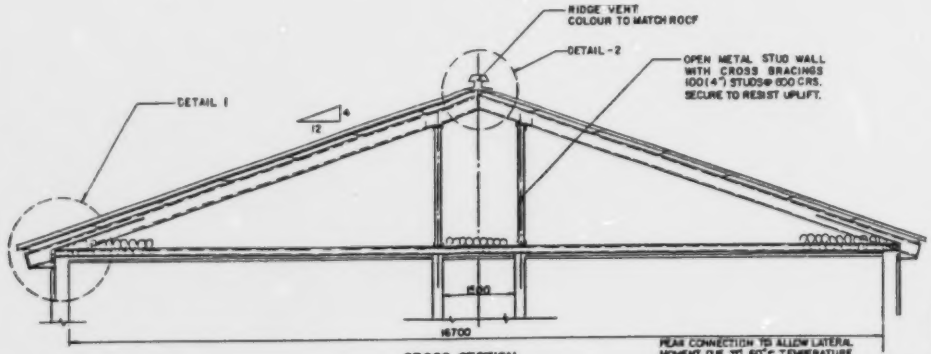
1. SEE ALSO GENERAL NOTES ON S1.
2. METAL DECK TO BE PREFINISHED, GALVANIZED STEEL SHEET, 0.68 MINIMUM THICKNESS, WITH 45 HIGH UPSTANDING SEAMED JOINTS AT 500 MAXIMUM CENTRES, AND DESIGNED TO SUPPORT INDICATED SNOW LOADINGS AT PURLIN SPACING INDICATED.

   JOINTS TO BE CAULKED OR GASKETTED AND ROLLED TIGHT AFTER INSTALLATION. ALL FASTENERS ARE TO BE CONCEALED. PROVIDE WEATHERTIGHT FILLER AT TOP AND BOTTOM OF ROOF SLOPE.
3. PURLINS, RAFTERS, AND STUD FRAMING TO BE COLD-FORMED GALVANIZED STEEL SECTIONS DESIGNED, FABRICATED AND INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF ONTARIO BUILDING CODE, CSA CAN3-S136, AND THE LATEST RECOMMENDATIONS OF THE CANADIAN SHEET STEEL BUILDING INSTITUTE.
4. DETAILED DESIGN SHALL TAKE INTO ACCOUNT DOWN-SLOPE COMPONENT OF GRAVITY LOADS AND LACK OF RESTRAINT OR DIAPHRAGH ACTION PROVIDED BY ROOFING.
5. DESIGN FOR TEMPERATURE RANGE +30°C to -30°C.
6. DETAILED SHOP DRAWINGS TO BEAR SEAL OF ENGINEER RESPONSIBLE FOR DESIGN, FABRICATION, AND ERECTION PROCEDURES, WHO SHALL BE EXPERIENCED IN THE DESIGN OF LIGHT-GAUGE STEEL MEMBERS.
7. GUTTERS ARE NOT RECOMMENDED FOR NORTHERN REGIONS, BUT IF THEY ARE INSTALLED, SPECIAL PROVISIONS SHALL BE TAKEN TO PROTECT BOTTOM OF ROOF SLOPE FROM PENETRATION BY WATER, SNOW, AND ICE.

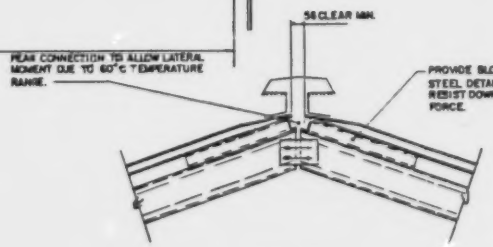
   GALVANIZED METAL SHEET, OR FIRE-RETARDANT TREATED PLYWOOD SHEATHING WITH SINGLE-PLY MEMBRANE IS RECOMMENDED BETWEEN PURLINS AND METAL DECK, FOR AT LEAST 2.5 M FROM GUTTER. ADJUST 'Z' PURLIN DEPTH ACCORDINGLY.

   SIMILAR PRECAUTIONS ARE NEEDED AT ANY VALLEYS OR PROJECTIONS THROUGH ROOF.

S-4

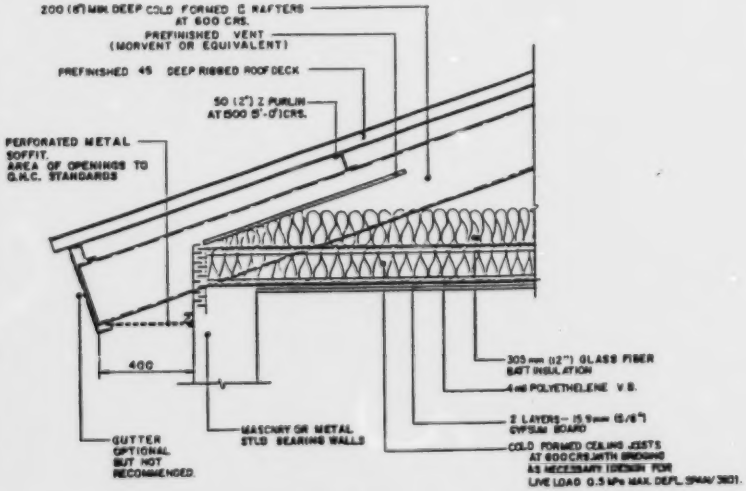


CROSS SECTION


50 CLEAR MIN.
PROVIDE BLOCKING OR STEEL DETAIL TO RESIST DOWN SLOPE FORCE.
REAR CONNECTION TO ALLOW LATERAL MOVEMENT DUE TO 60°C TEMPERATURE RANGE.

DETAIL-2

ALTERNATIVE DETAIL FOR THERMAL BREAK AT CEILING JOIST


200 (8") MIN. DEEP COLD FORMED C RAFTERS AT 600 CRS.
PREFINISHED VENT (NORVENT OR EQUIVALENT)
PREFINISHED 45 DEEP RIBBED ROOF DECK
50 (2") Z PURLIN AT 500 5'-0" CRS.
PERFORATED METAL SOFFIT. AREA OF OPENINGS TO O.N.C. STANDARDS
400
GUTTER OPTIONAL BUT NOT RECOMMENDED
MASONRY OR METAL STUD BEARING WALLS
305 mm (12") GLASS FIBER BATT INSULATION
4 mil POLYETHELENE V.B.
2 LAYERS - 15.9 mm (5/8") GYPSUM BOARD
COLD FORMED CEILING JOISTS AT 600 CRS. WITH BRIDGING AS NECESSARY (DESIGN FOR LIVE LOAD 0.5 kPa MAX. DEFL. S/240 OR 360).

DETAIL 1

ALTERNATIVE 4 - COLD FORMED METAL JOISTS AND RAFTERS AT 600CRS.

Ontario
Ministry of Housing
Architectural Services
Technical Support Branch
777 Bay Street
Toronto M5G 2E5 Ontario

Project
NON COMBUSTIBLE SLOPING ROOF ASSEMBLIES

Design RH
Drawn AR

Sheet S-4

ALTERNATIVE NO. 5 - COLD-FORMED METAL TRUSSES WITH METAL ROOF DECK

1. This system is illustrated on Drawing S5.

2. It represents a truly non-combustible equivalent of Alternative No. 2.

3. The same comments regarding the supply and design of cold-formed members apply to this system, as outlined for Alternative No. 3.

4. All metal roof systems present the possibility of "drumming" in hail or heavy rain storms. Alternative No.'s 4 and 5, which do not have either a plywood roof deck, or the mass of a precast concrete structure at ceiling level, may transmit more noise than the other systems.

NOTES

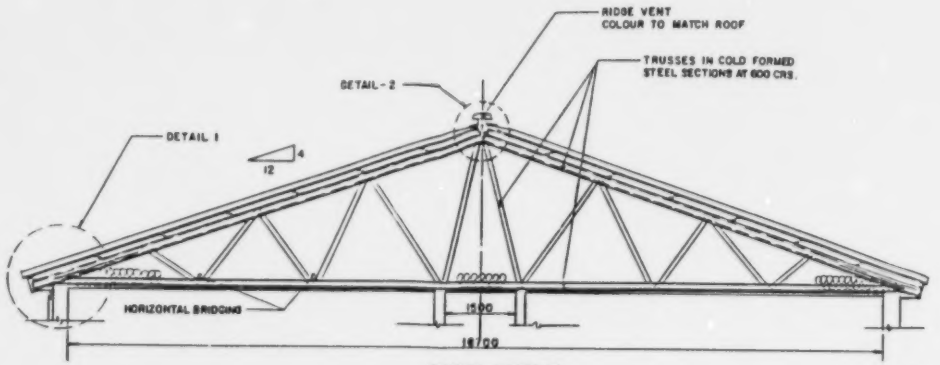
1. SEE ALSO GENERAL NOTES ON S1.
2. METAL DECK TO BE PREFINISHED, GALVANIZED STEEL SHEET, 0.68 MINIMUM THICKNESS, WITH 45 HIGH UPSTANDING SEAMED JOINTS AT 500 MAXIMUM CENTRES, AND DESIGNED TO SUPPORT INDICATED SNOW LOADINGS AT PURLIN SPACING INDICATED.

   JOINTS TO BE CAULKED OR GASKETTED AND ROLLED TIGHT AFTER INSTALLATION. ALL FASTENERS ARE TO BE CONCEALED. PROVIDE WEATHERTIGHT FILLER AT TOP AND BOTTOM OF ROOF SLOPE.
3. TRUSSES AND PURLINS TO BE COLD-FORMED GALVANIZED STEEL SECTIONS DESIGNED, FABRICATED AND INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF ONTARIO BUILDING CODE, CSA CAN3-S136, AND THE LATEST RECOMMENDATIONS OF THE CANADIAN SHEET STEEL BUILDING INSTITUTE.
4. DETAILED DESIGN SHALL TAKE INTO ACCOUNT DOWN-SLOPE COMPONENT OF GRAVITY LOADS AND LACK OF RESTRAINT OR DIAPHRAGM ACTION PROVIDED BY ROOFING.
5. DESIGN FOR TEMPERATURE RANGE +30°C to -30°C.
6. DETAILED SHOP DRAWINGS TO BEAR SEAL OF ENGINEER RESPONSIBLE FOR DESIGN, FABRICATION, AND ERECTION PROCEDURES, WHO SHALL BE EXPERIENCED IN THE DESIGN OF LIGHT-GAUGE STEEL MEMBERS.
7. GUTTERS ARE NOT RECOMMENDED FOR NORTHERN REGIONS, BUT IF THEY ARE INSTALLED, SPECIAL PROVISIONS SHALL BE TAKEN TO PROTECT BOTTOM OF ROOF SLOPE FROM PENETRATION BY WATER, SNOW, AND ICE.

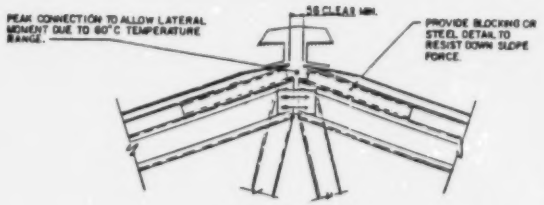
   GALVANIZED METAL SHEET, OR FIRE-RETARDANT TREATED PLYWOOD SHEATHING WITH SINGLE-PLY MEMBRANE IS RECOMMENDED BETWEEN PURLINS AND METAL DECK, FOR AT LEAST 2.5 M FROM GUTTER. ADJUST 'Z' PURLIN DEPTH ACCORDINGLY.

   SIMILAR PRECAUTIONS ARE NEEDED AT ANY VALLEYS OR PROJECTIONS THROUGH ROOF.

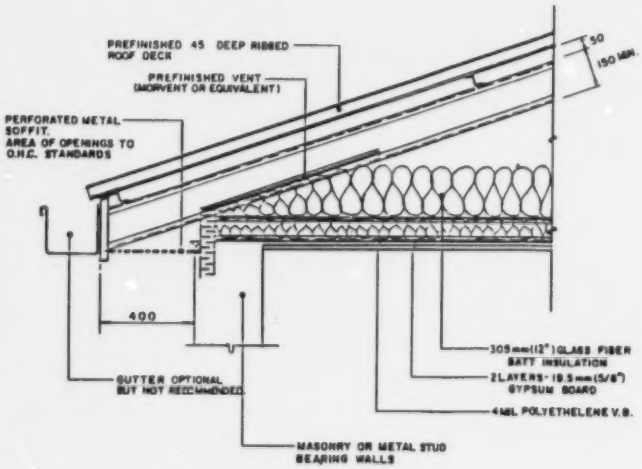
Sheet S-5



CROSS SECTION


PEAK CONNECTION TO ALLOW LATERAL MOVEMENT DUE TO 60°C TEMPERATURE RANGE.
50 CLEAR MIN.
PROVIDE BLOCKING OR STEEL DETAIL TO RESIST DOWN SLOPE FORCE.

DETAIL-2


PREFINISHED 45 DEEP RIBBED ROOF DECK
PREFINISHED VENT (MONVENT OR EQUIVALENT)
50
150 MIN.
PERFORATED METAL SOFFIT. AREA OF OPENINGS TO O.N.C. STANDARDS
400
GUTTER OPTIONAL BUT NOT RECOMMENDED
305mm(12") GLASS FIBER BATT INSULATION
2 LAYERS-15.5mm(5/8") GYPSUM BOARD
4MIL POLYETHELENE V.B.
MASONRY OR METAL STUD BEARING WALLS

DETAIL 1

ALTERNATIVE DETAIL FOR THERMAL BREAK AT CEILING JOIST

ALTERNATIVE 5 – COLD FORMED STEEL TRUSSES AT 600CRS.

Ontario
Ministry of Housing
Architectural Services
Technical Support Branch
777 Bay Street
Toronto M5G 2E5 Ontario

R. HALSALL

Project: NON COMBUSTIBLE SLOPING ROOF ASSEMBLIES

Design RH
Draft AR

Sheet S-5

ESTIMATED COMPARATIVE COSTS

1. Base price, for precast prestressed concrete roof deck with sloped lightweight fill, 100 mm polystyrene insulation, 108 kg/m^2 ballast. Masonry insulated cavity wall parapet. (Drawing S1) — $162.00/m^2

2. Fire-retardant, pressure treated wood trusses and plywood deck, with 0.05 mm aluminum sheet over plywood. 2 layers 15.9 mm drywall, Type 'X' ceiling. 305 mm glass fibre batt insulation. Eaves and ridge ventilation. Asphalt shingle roof finish. (Drawing S2) — $157.00/m^2

3. As in Scheme No. 2, but with prefinished metal roof finish. (Drawing S2) — $225.00/m^2

4. Prestressed precast concrete structural roof deck, with built-up open metal stud walls and cold-formed rafters. 305 mm glass fibre batt insulation. Eaves and ridge ventilation. Prefinished metal roof deck. (Drawing S3) — $223.00/m^2

ESTIMATED COMPARATIVE COSTS - (Continued)

5. Cold-formed metal ceiling joists and roof rafters, on open metal stud walls over corridor walls, 2 layers 15.9 mm drywall ceiling, 305 mm glass fibre batt insulation, eaves and ridge ventilation. Prefinished metal roof deck.
(Drawing S4) $252.00/m^2$

6. Cold-formed metal prefabricated trusses. 2 layers 15.9 mm drywall ceiling, 305 mm glass fibre insulation, eaves and ridge ventilation. Prefinished metal roof deck.
(Drawing S5) $258.00/m^2$